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OUR COAL AREAS

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OUR COAL AREAS

BY JAMES P. HOWLEY, F.G.S.

It would seem almost preposterous for me to tell you anything about coal, or what are its uses. Everybody who has ever seen this dirty black substance being unloaded from shipboard, carted through the streets, dumped into our cellars, or burning in our grates, knows what it is like and that we use it to produce heat and light, etc., but how many enquire further into the nature and composition of coal, or all the many uses to which it can be applied?

The whole history of Coal is, however, a subject of a most interesting and instructive character. I will endeavour briefly to outline it, treat of its composition and tell something of its best known utilities.

The process by which it came into existence would be too lengthy to enter into fully here. I shall therefore, merely give a brief outline of how this was brought about.

To begin with, Coal is almost exclusively a vegetable product, the principal element of which is carbon. Though now reckoned as a mineral, it was not always as we see it to-day. At certain periods of the earth's construction, a very rank vegetation grew upon portions of its surface. A moist, warm climate, and an atmosphere surcharged with carbonic acid gas, seem to have prevailed at the time, conditions eminently conducive to this growth of vegetation, of exceptional luxuriance, in contrast with which the most prolific tropical vegetation of the present time pales into insignificance. Gigantic trees and plants, which in our time are merely represented by shrubs, such as ferns, club mosses, equisitacea or horse tails, as well as many reeds, grasses, etc., entered into its composition. Some of these trees reached diameters of 3 feet or more, and attained to heights of from 40 to 100 feet. Reeds and ferns of magnificent proportions grew in great abundance, besides numerous other forms of plant life, most of them long since extinct.

All these facts are clearly attested by the well preserved fossil remains and impressions of those trees and plants now to be seen in rocks of the carboniferous period. The structure of the coal itself, when examined under a microscope, reveals the fact that it is simply a compressed mass of vegetable matter. It is composed of nothing, more or less, than the decayed leaves and bark of the plant life of the period. This vast accumulation of vegetable matter with the soil supporting it, then gradually became submerged, caused probably by shrinkage or other earth movements, and was covered over with deposits of sand, gravel, and clay. This, in time, produced a new surface, upon which another similar growth took place, to be buried in turn, as was the first. The process must have gone on for ages, as the numerous layers of coal, sand and clay indicate. The great weight of the covering matter compressed the layers of vegetable mould, and together with certain chemical changes brought about by decomposition, finally converted it into coal. How immensely thick these vegetable accumulations must have been, may be judged from the fact that it is estimated it took between 30 and 40 feet in thickness to produce under pressure, one foot of coal. Imagine, then, at this estimate, what must have been its original bulk, when there are to-day many coal seams reaching a thickness of 30 feet or more. All this has been thoroughly studied out, by the most eminent scientists, and there can be no manner of doubt about their conclusions. The earth or soil which supported this vegetation is still to be seen underlying the coal seams, filled with the roots and trunks of the trees. Frequently large stumps or portions thereof, are seen with their roots still attached, buried in the underlying soil, while their trunks project upwards into the coal beds themselves. So perfectly are these fossils preserved, that every feature of their structure can be distinctly made out. In many cases the woody fibre of the trees, in the form of charcoal, is clearly perceptible. Fossil botanists are thereby enabled to determine their botanical structure, and give a name to each individual species, with just as much accuracy as others can examine and name the living growth of the present time. I might here state that this vegetation of the coal period differs entirely from what we now behold. Such common trees and shrubs as the Fir, Spruce, Pine, Larch, Birch, Alder, etc., had no existence. The only plants of our time at all resembling those of the above period are certain Fern trees of Australia, and some Bamboos or Canes, but they are not the same. It was thus, then, the coal layers, or seams, as they are termed, came into existence. These seams, upon analysis are found to be composed chiefly of carbon and certain volatile substances such as bitumen, oil, gas, etc., mixed with a greater or less proportion of earthy matter.

Perhaps a clearer idea of the process by which coal seams were formed, might be conveyed by a consideration of the well known peat-bogs, so abundant in our country. These are simply vegetable accumulations on the surface of the earth, composed chiefly of club mosses, spagnum and other simple forms of vegetation in a state of decomposition. Could these peat-bogs be subjected to the same forces that were at work during the carboniferous period, such as great pressure under a thick cover of sand and gravel, aided by internal decomposition, they would eventually become coal.

Various attempts have been made, as you all are aware, to effect this by artificial means. What Nature in her grand laboratory accomplished long ago, insignificant man has attempted, and although fuel of a fairly good quality has been turned out, it is scarcely possible, that real coal can ever be produced by human ingenuity.

The character of coal seams varies very considerably. They range from soft, dull coloured, highly bituminous (cannel) or soft coal, to the hard, shining, black Anthracite (or hard coal) as it is termed. When the carbon contents reach 60 per cent, and bitumen nearly half as much more, the combination produces a good household coal. When higher in carbon, with a less amount of bitumen, it produces good steam coal, provided it is fairly free from deleterious substances, and when still higher in fixed carbon, with quite a small percentage of volatile ingredients, it becomes Anthracite. Still further, when the carbon alone is present without any volatile matter, it is no longer coal, but graphite, commonly called black lead. Not only is this substance not coal at all, but it is non-combustible, and on that account is largely used in making crucibles for the smelting of metallic ores. Other well known uses of graphite are for polishing purposes, for making our common lead pencils, and on account of its softness and greasy nature, it is employed to a considerable extent in connection with machinery, being much used to counteract the friction of the bearings, etc. This graphite, in its purer form, is very valuable and not over plentiful. The best now produced comes from the Island of Ceylon. It is extensively mined in Cumberland, England, and so precious was it considered at one time, that the mines were strictly guarded to prevent peculation of the material. A strong house was built over the shaft, the doors of which were bolted and locked, while the men were at work within. On coming to the surface at the end of a shift, they were closely searched and made discard their mining clothing before they were allowed to leave the shaft houses, lest they might have any of the precious material concealed about their persons. An armed guard was constantly stationed in a room overlooking this operation. There are numerous deposits of inferior graphite mixed with rock and earth in various parts of the world. We have a good deal of this quality here in Newfoundland. Nowadays, with modern machinery and modes of treatment, these can be utilized by being purified from earth and dross. This constitutes much of the stove polish in use.

Before leaving this part of my subject, I must not omit to mention that the chief ingredient of all coals, carbon, when in a crystalized condition constitutes the most precious of precious stones, the Diamond. It is a very curious fact that while most forms of coal are comparatively soft, this crystalized carbon, or Diamond, is the hardest substance in nature. It will cut or scratch any other mineral, and nothing but a diamond itself will cut another diamond, hence the expression, "Diamond cut Diamond."

But to return to coal proper, there is an infinite variation in the quality of the product. Coals with too high a percentage of earthy material are, as a rule, of poor quality, owing to the amount of ash and slag they leave behind during combustion. When considerable pyrites is present, as is often the case, it becomes very injurious to the furnaces. This pyrites, which is that bright, brassy material frequently seen on the cleavage places of some coals, is a compound of sulphur and iron. The sulphur, when liberated, during combustion, unites with the bars of the grate, and soon destroys them. Sulphur has an extraordinary affinity for iron in any form, and will pass from its original habitat, to combine with the iron. If any person wish to demonstrate this fact for himself, he need only procure a stick of sulphur, heat a piece of iron to redness and bring the two in contact, when he will see the iron eaten up, as it were, by the sulphur. A good, clean coal, then, must be as free as possible from pyrites and clay.

When speaking of coal, I am frequently asked whether such and such a seam is workable or of workable dimensions. It appears to me that few who ask this question have any real conception of what constitutes a workable coal seam. Most people appear to think that to be workable, a coal seam must be of a certain thickness, say 3 or 4 feet at least. This is altogether a mistake. Coal seams of only 2 or 2½ feet, when of good quality and favourably situated, are workable whereas, others of 10, 20, or even 30 feet, of an impure character, are not so. Others, again, owing to their being split up into thin layers with frequent clay or shaley partings, or otherwise too pyritiferous, are of little account. The New Brunswickers are working to-day, with advantage, seams of 18 to 30 inches in thickness, and in some parts of England, seams of Cannel coal of from 6 to 14 inches are being worked, because they are good gas producers. So you will see that the quality of being workable does not always depend upon their thickness. No doubt a time will come when seams of a foot or less, will be more generally utilized particularly if several such small seams come sufficiently close tc each other, to allow of their being worked as one.

We have now treated of the mode of production, occurrence and composition of coal seams. To elaborate further upon this part of my theme would be altogether beyond the scope of one short paper. Suffice to say, no substance in Nature has undergone such a number of changes in the process of its formation. It has passed through hundreds of different stages, each more varied than the other.

It may not be out of place here, and for the better understanding of the subject, to give a brief outline of the Geological structure of what is termed the Carboniferous series of rocks. This great series comprises a total thickness of between 14 and 15,000 feet in some places, and is divided into several groups. The lowest is called the Carboniferous Limestone formation. Next comes the Millstone grit, then the True Coal Measures, and on top of all the Permian or Upper Carboniferous formation, though the latter is now generally separated from Carboniferous. Of course not all these groups are present in one country, or in one district at the same time, for instance, while we find in Newfoundland the three first, or lower formations well represented, the Permian or Upper division is absent altogether.

The bas[redacted] [redacted] of the series generally consists of thick layers of coarse conglomerate made up of rolled worn boulders, small rocks and gravel. It would appear to have formed an ancient beach, and is very similar to any of the coarse beaches to be seen on many parts of our coast line. The worn appearance of its constituents was caused by attrition of one piece of rock against another, which has removed their angles and rendered them round and smooth. No doubt the action of the waves washing on the beach caused this abrasion.

To all appearances, then, this [redacted] conglomerate closely resembles our modern sea beaches, with this difference, that the mass, instead of being loose, is cemented together by clay and gravel which acted as a binder. Little, if any animal or plant life, seems to have existed during the laying down of this conglomerate. Indeed, we could scarcely expect it..

The succeeding carboniferous limestone formation is made up of sandstones, marls, limestones, etc., generally of a reddish, brownish or other dull colour. All indicate submarine deposits. The limestones in particular, contain numerous fossil shells of deep sea species. It is in this part of the series also the Gypsum deposits occur, and they are frequently accompanied by salt or brine springs. It is clear that during the laying down of these marine deposits no terrestrial vegetation existed. These two basic formations when taken together give a thickness, in Cape Breton, of between 1,800 and 2,000 feet, in which no coal seams occur.

The next succeeding, and perhaps, most extensive formation of the series, the Millstone grit, is chiefly composed of coarse grits and sandstones, with occasional fine grained and somewhat shaly beds. It would seem to indicate that the seas or estuaries were gradually filling up, no doubt accompanied by a general uprising of the bottom as well. It was a sort of progressive or transition stage towards the next and by far most important of the whole carboniferous period,—the laying down of the True Coal Measures.

A few fossil trees and plants appear embedded in the rocks of the Millstone grit towards the top, and in some places thin coal seams occur. The thickness of this formation varies much, but may be taken as somewhere between 2,000 and 3,000, or say 2,500 feet, in Cape Breton Island.

But it is in the succeeding Coal Measure formation proper, that coal seams of real importance begin to show themselves. Most of the rocks of this division are sandstones and shales with their interbedded coal seams. The shales are usually of grayish, brownish, and blackish shades of colour. There can be no mistaking them on account of their numerous embedded fossil plants and trees. Here I might say that unless these sure indications of the probable existence of coal are met with in the rocks, it would be useless to look for it. If this fact were more generally recognized, there would not be so much money wasted in trying to find coal where it never existed or could exist.

This, then, is the really important division of the whole Carboniferous series. Like the preceding Millstone grit, it also varies much in thickness. Sir Wm. Logan estimated at the Joggings section, on the shores of the Bay of Fundy, that it reached the enormous thickness of 4,673 feet, but in Sydney Harbour, C.B., it is only about 1,860 feet. Needless to say it is this section or formation of the Carboniferous Series which contains all the coal seams of importance, at all events on this side of the Atlantic.

Some few workable coal beds do occur in Scotland, low down in the Carboniferous Series, even beneath the Millstone grit formation.

The upper or Permian formation does not contain coal of any consequence. It would appear to represent a retrocession or gradual return to the non-productive periods at the base of the series.

NOTE.—Coal is not entirely confined to the so-called Carboniferous period, for it is known also to occur in several more recent rock series, especially the Cretacious. Most of the coals in these latter is what is termed lignite or brown coal, greatly inferior, as a rule, to the true coal of the coal measures. Much of the coal of Western Canada, China and India, etc., is of this class. While it is of very great value to the countries which possess it, still it can never equal that of the preceding Carboniferous era.

We will now pass on to the consideration of the utilitarian aspect of coal. Hugh Miller speaks of it as, "the stored up fuel of a world." Another authority poetically describes it as "stored up concentrated sunshine." While still others speak of it in somewhat similar felicitous terms. Indeed, one authority considers it "the most precious of all minerals." Perhaps there is no substance in nature that possesses more utilitarian properties than coal. "In it is stored up a force that saves the wear and tear of human muscle and sinew, does away with the fearful toil that makes slaves of men, and enables them to gain their daily bread by easier means."

Its utilization for generating steam has revolutionized the whole industrial aspect of the world. This great motive power, steam, is that which sets the machinery of our mills and factories in motion, speeds our locomotives with their enormous train loads of freight, over the surface of the earth, carries from distant points the products of one country, or one district to another, and propels the ocean greyhounds with their human cargoes at so rapid a rate, across the great expanse of waters, separating Continent from Continent. It is steam which enables the Press, that great modern aid to civilization and enlightenment, to reel off its miles of literature and disseminate it to the remotest corners of the earth. But all this is apparent to any thinking person.

Is it any wonder, then, that we should look upon the possession of this natural product as one of the greatest —if not the greatest blessings—conferred upon mankind?

Some thoughtless persons may imagine that gold silver and such like precious metals are of more value than coal. A little reflection would soon convince them of the contrary. We could do without the former and still advance, but without coal, the World's progress would soon be at a standstill. Without its aid in the reduction of metallic ores, especially of iron and copper, these latter would be comparatively useless. True, of late years electrical energy produced from the movement of great bulks of water (white fuel), so called, has been utilized in lieu of coal for heating, lighting and other purposes, but there are many uses to which coal is applied which can scarcely be superseded by electricity. Take, for instance, an ocean going steamer, she cannot carry a sufficient stock of electrical energy on board. Of course oil fuel of late is coming into use for steamship propulsion, yet petroleum is, after all, but another form of coal, or coal in a liquid state.

Considering the question in all its bearings, and the possible substitution of other power-producing forces in the future, we cannot get away from the fact that it will be a long time, if ever, that the world can look forward to coal becoming no longer a necessity.

I could elaborate almost indefinitely upon this phase of the subject, but it is so patent to even the most casual observer, that there is no necessity for my doing so.

Suffice it to say that any country possessing an abundant supply of this most useful substance, has within itself one of the greatest, if not the very greatest factors for future progress and advancement. If, in addition to coal, it also possesses other mineral substances in abundance, which can be utilized in conjunction therewith, its future should be assured.

Although mineral coal has only been in general use for heating purposes for a little over a century, it has proven one of the greatest agents in the progress, advancement and civilization of our world.

If we look around for its effect on the prosperity of a country, we will find ample evidence on all sides, so much so, that it would almost appear as though its possession or non-possession marked the line between poverty and prosperity, greatness and nothingness, civilization and savagery.

"Show me a geological map of a country," said the great Dr. Buckland, "and I can point out where its future prosperity lies, and where its manufactures and kindred industries will be established." This applies particularly to its coal districts, should it happily possess such.

It has been said that Britain owes her greatness as much to her coal and iron deposits as to any other source. These hives of industry, such as Manchester, Sheffield, Newcastle, the Clyde, etc., all owe their great activity to coal. Lancashire, which at one time was, to a great extent, an uninhabitable morass, has, through its coal development, become one of the most populous shires of the United Kingdom, and has more inhabitants to the square mile than almost any equal area in the world.

Coal is unlike any other mineral product, inasmuch as it is a marketable commodity in its raw state, just as it comes from the pits' mouth. It requires no process of manufacture to render it available commercially. It is the very basis of all trades and manufactures, and no country entirely destitute of it can hope to advance in the same ratio, or hold its ground with those possessing an abundant supply of this most useful article.

It has long been demonstrated that Newfoundland is rich in Copper ores, and that in Bell Island alone, we possess one of the largest and most unique deposits of iron ore in the world, it only remains to be proven whether also her coal deposits are of that character and importance that would warrant us in looking forward to a great future industrial boom. I shall endeavour to convince the most skeptical that such is in reality the case, and should my effort prove successful, I shall feel amply rewarded.

As regards the existence of coal in this country, I would first ask the question. Why should there not be **coal here?**

The same series of rocks which contain the chief coal deposits of the world are found here, on the western side of our Island in the Codroy Valley, St. George's Bay District, and on the Humber Valley. They contain in abundance, the self same species of fossil trees and shrubs that were shown to have produced coal seams elsewhere. Perfect examples of these are found embedded in the rocks in many places, and most beautiful impressions of the fossil leaves and rootlets are sometimes so abundant as to constitute thick beds of black Carbonaceous earthy shale, or impure coal. Some of these beds are literally crowded with fossils. (Here are a few that will show what they are like.) These fossil roots, stem and leaves, are the true index to coal deposits, they contain the written "testimony of the rocks" holding their historic records. When properly interpreted they tell us the facts as related above. They may be likened to samples of the materials which go to constitute coal seams, which latter are the finished products. Would it not then be a peculiar circumstance should coal deposits not exist? Indeed it would be contrary to the order of Nature, or the evident design of the Great Architect of the Universe, but Nature makes no mistakes. The undeniable evidence of coal deposits upon investigation has proven that Newfoundland is no exception to the general rule. While it may not possess so much coal as other more favoured countries, nor yet such extensive and large seams, it has nevertheless, been clearly demonstrated that its coal deposits are of no mean order and it now only requires the application of capital enterprise and skilled labour to bring about a genuine coal industry in the country.

We will now pass on to the consideration of our own Coal deposits. To begin with we have in Newfoundland three distinct and separate coal fields. The first is situated in the Valley of the Codroy Rivers; the second, inland from the South Shore of Bay St. George about 10 miles from the sea shore, or 8 miles from the nearest point of the Reid Railway; whilst the third is on the Humber Valley between the Grand Lake and Sandy Lakes.

There may be a few outlying patches elsewhere, but these will be too small to be of much economic importance.

In the first field, that of the Codroys, but a small section of the coal measures, as the coal bearing portion of the great Carboniferous series is called, occurs. Nevertheless, six seams of coal have been uncovered in this section and two of these are the largest yet come across in Newfoundland. One seam at its outcrop, showed a thickness of 9½ feet of good clean coal, while another gave 15 feet in total thickness, and averaged, so far as examined, 7½ feet. The other four are much smaller. All this coal is of excellent quality and some of it was used upon the locomotives of the Reid Railway giving every satisfaction as a steam producer.

The Messrs. Reid did some mining here, and took out about 100 or 150 tons, but finding the seams decreasing in thickness as they proceeded, the mining was abandoned by them, for the time being.

Unfortunately this little coal field was found to be cut off by a great fault or break in the strata, but a small segment of a basin being left jambed up against the foot hills of the Long Range of mountains.

In the second, or Bay St. George area, we have perhaps, the most promising, though not the most extensive coal field in the Island. This has been traced in a longitudinal line from W.S.W. to E.N.E. five miles and may extend a few miles further. The best exposures of coal are near the western end of the trough on the Middle Barachois (Barrisway) River. Here it shows a width of about 2 miles. In the section exposed along the banks of this river there are 12 separate coal seams ranging from a few inches to over 5 feet in thickness. They all incline inland but come to the surface again further up stream, with an opposite inclination i.e. pointing towards the coast. On Robinson's River, 2 miles further East three seams were uncovered, one of which, the Howley seam, gave a thickness of 4′ 2″ good clean coal.

Two and a half miles still further east on a tributary of the Robinson River, known as the Northern Feeder, four seams were uncovered, one only of any importance. Although this was but 1′ 2″ at its outcrop, it was found to increase in thickness when sunk upon for a short distance. This coal, though of such small dimensions, is of superior excellence, being bright, clean, and fairly hard, but of a highly bituminous character. It was extremely free from sulphur or other deleterious substances, and should afford a first class gas coal.

What the full extent of this most promising coal field may be, has never been ascertained. Owing to the fact, that it was long held by private parties, no Government felt warranted in investigating it fully under the circumstances. Consequently, a boring drill has never been put upon it with a view to ascertaining its full extent and importance. We know, however, that at least two seams of over 4 feet thick each, the Jukes' and the Howley seams, are well worth working. The coal in them is of first class quality and they are so situated, more especially the Jukes', that a large portion of its coal contents could be removed by open quarry work.

The only thing required to render this Bay St. George field accessible for profitable working is a short branch rail or tramway to connect it with the Reid system or with the sea coast.

Together with the Jukes', Howley and Shears seams already referred to, and taking only into account seams of one foot and upwards in thickness, the section contains the following:—

On Middle Barachois River.

	Feet	In.
*Murray Seam	5	4.
Rocky Seam	1	5.
Clay Seam	1	8.
Slaty Seam	1	4.
18 inch Seam	1	6.
Jukes' Seam	4	8.
Cleary Seam	2	2.

On Robinson's River.

Howley Seam	4	2.

On Northern Feeder.

Shears Seam	1	2.

The agregate thickness of all the seams in this trough is 27 feet which would give about 25,000,000 or 26,000,000 tons for every square mile they may underlay. A small outlying trough on the north side of St. George's Bay contains a few thin seams of little consequence, though possibly, there may be others there of larger dimensions and better quality.

The third, and decidedly most extensive coal field in the Island is that of the Humber or Grand Lake area. The latter lies nearly 100 miles in a straight line N.E. from the Bay St. George trough.

This Grand Lake area has been the most difficult of all to explore. The country for many miles in every direction is so exceedingly flat, and covered with such a thick mantle of sand, gravel, and boulders, with scarcely an outcrop of the rock formation, as to render its thorough examination, one of the most difficult geological problems, perhaps to be found in North America. Nevertheless, after the most careful survey of the territory and a close study of all the facts that could possibly be ascertained, aided by the extensive use of pick and shovel, and finally of the Calyx boring rod, we have learnt sufficient to place beyond question the existence of a large and most important coal field. How large and how important has yet to be determined.

The work done to date in this region has revealed the existence of one narrow trough of coal measures, which has been traced 11 miles longitudinally, and from all appearances must continue 5 or 6 miles further. A few good sections were uncovered on the south side of Grand Lake, about a mile from the shore. The first of these on Aldery Brook, exhibited fifteen seams of coal, doubled up almost in the form of the letter U.

Most of the seams are quite small but those over a foot in thickness are:

	Feet	In.
No. 1 Seam	1	6
No. 2 Seam	1	8
No. 3 Seam	2	0
No. 4 Seam	2	6
No. 5 Seam	3	0
No. 6 Seam	6	6

The Reid Co. ran a drift along this latter seam for 150 feet, and took out over 100 tons of beautiful bright coal. This, with perhaps 50 or 60 tons more from other seams close by, is still lying in the woods, crumbling to pieces under the influence of the weather.

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*Though this is the largest seam in the section, it is so split up by shaley partings and is of such poor quality as to be scarcely worth working at present.

On Coal Brook, one and a half miles East of Aldery, the section exposed gave:—

	Feet.	In.
No. 1 Seam	1	0
No. 2 Seam	1	0
No. 3 Seam	1	4
No. 4 Seam	1	6
No. 5 Seam	2	4
No. 6 Seam	3	5

The Messrs Reid mined some 7,000 tons from the latter seam, and used it on their Railway.

On Kelvin Brook, two and a half miles eastward, and on the same line of strike, but a small section could be reached by pick and shovel, and here again nine seams were uncovered, three of which gave the following dimensions:—

	Feet.	In.
No. 1	2	6
No. 2	3	8
No. 3	6	2

Three and three-quarter miles eastward of Kelvin Brook, close by the Railway track and about a mile beyond Goose Brook, three seams were uncovered some years ago, and one of them was mined to some extent by the Messrs. Reid. After they had abandoned the enterprise, the Calyx boring drill was brought into requisition, and sixteen holes were put down near Goose Brook, resulting in the locatng of a new trough of the Coal Measures, containing thirteen new coal seams. Most of these were again small, but omitting those already mentioned near Goose Brook, we have:—

	Feet.	In.
No. 1. Seam	3	0
No. 2. Seam	2	6
No. 3. Seam	1	0
No. 4. Seam	2	4
No. 5. Seam	1	0
No. 6. Seam	1	6
No. 7. Seam	4	4
No. 8. Seam	6	0

I would merely add here that we do not yet know the full extent of any of those coal fields, and it may take many years, if ever, to find out all there is yet to be learned about them. I am quite convinced from what I have seen, that there is yet at least one other trough of coal measures nearer the Grand Lake, of which we know nothing, as to its extent, and value, or of its coal contents.

It has taken a long time to beat down the prejudice and remove the indifference displayed about our native coal deposits. Now that happily there seems to be a growing belief in their existence, I hope it will not take quite so long to get things in motion.

Just so our timber growth was once looked upon as useless, rotten scrub and unfit for any purpose, until a great captain of industry, in the person of Lord Northcliffe, was forthcoming, to demonstrate the contrary. He could see that in it we possessed a vast pulp and paper supply, and was willing to invest his millions in utilizing it. So it is with our coal, at present lying idle and useless in the bowels of the earth, believed in by few, decried by the many. Is it to remain there unutilized for all time to come? At present we are being bled beyond endurance for an inferior article of this absolutely necessary commodity.

I have done my part to bring the knowledge of these coal deposits to the public; I cannot do much more. It is now up to those who possess or can command capital to do the rest.

For my own part I see in this coal question more promise of remunerative results than in any other mining enterprise in the Island, not excepting the Bell Island Iron Mines.

I have the best of authority for stating that over $100,000 were expended on the latter before one cargo of ore was shipped, or before one cent was returned on the outlay. Even then, it was uphill work for a long time to secure a favourable footing for this ore in foreign markets. The English iron masters would not touch it, and the Americans had such an abundant supply of their own that they did not want it. But the energy and perseverance of the Nova Scotia Steel Co. overcame all obstacles and now the ore finds favour everywhere.

The whole question of the World's future coal supply is engaging the serious attention of scientists. The enormous rate of consumption of this absolutely necessary fuel in the World's industrial advancement is causing its diminution at so rapid a rate that fears are being entertained that the visible supply will not hold out to any lengthened period.

Acting upon this impression, a meeting is to be held in Toronto during the coming summer, of the International Geological Congress, to consider the matter fully. Persons from every country containing coal, or who know anything about their coal resources, have been invited to visit the Congress and read or furnish papers, setting forth as fully as possible what their country's coal prospects are.

I have received an invitation amongst others, either to attend in person or furnish a paper on our Newfoundland Coal areas, etc., and have already complied by forwarding the fullest information in my possession. Should I not be able to attend in person, this paper will be read before the Congress and incorporated in the publication of the proceedings later. It is to be hoped that it may have the effect of drawing attention as fully to this country's coal resources, as a previous one on our iron ore resources read at a Congress, held in Stockholm two years ago, had.

As regards the importance of our coal deposits, I shall quote here a few notes from two of the highest scientific authorities.

Some years ago I had quite a correspondence with the late Sir Wm. Dawson, Principal of McGill University, a great authority on Carboniferous geology, to whom I had submitted all my facts relative to our coal fields. He wrote me as follows: "Your Government might make a point as to the west shore, by informing the English Government of the value of the coals on the west coast and their prospective importance to Britain and Newfoundland, as well as to the other colonies. **You have the nearest coal to England on this side of the Atlantic."**

This was before the settlement of the French Shore question.

In 1896, Sir Herbert Murray, the then Governor, who took a deep interest in this question, asked me for a report upon our coal fields, which was forwarded to the Imperial Government and submitted by the Colonial Office to the eminent head of the English Geological Survey, Sir Archibald Geikie. After studying all the facts contained therein, Sir Archibald in replying to Mr. Chamberlain, the then Secretary for the Colonies, said, amongst other things: "There can be no doubt that the development of these coal fields will be of the utmost importance in the progress of the Colony."

Upon the development of the Coal fields all the other mineral industries will largely depend.

It may prove interesting to give here a few notes of comparison between the Sydney, C.B., coal fields, and those of Newfoundland.

According to Mr. Richard Brown, F.G.S., who made an exhaustive study of the Cape Breton Coal Fields, the result of which was published in 1871, his estimate of the total thickness of coal measure strata at Sydney Harbour was 1,860 feet.

In this section there are 23 distinct coal seams aggregating 36'3" of coal, only four of which were then considered workable, viz., the Cranberry Head seam 3'8"; Lloyd's Cove seam 6'0"; Sydney main seam 6'00"; Indian Cove seam 4'8". Of the remaining 19 seams, four only are over a foot in thickness, one of these, the stony seam, having 3' of coal, but it was so split up by partings of clay and shale as to be considered valueless. All the remainder run from 2" to 1 foot only. Fourteen of the nineteen scarcely average 6" each.

From this it will be seen that the percentage of workable seams in Sydney is very small, and the average of coal to rock is about one foot of coal to every 51½ feet of strata.

So far as our investigations in the Bay St. George and Grand Lake coal areas have been prosecuted, the conditions and occurrence of coal in the series appear to be almost identical. In fact, the proportions of coal to strata in some cases would seem to be in our favour.

In Bay St. George section it has been shown that sixteen seams, aggregating 27 feet of coal altogether, have been located, and there is scarcely a doubt that others still exist which will require the use of the boring rod to locate. As stated already, no boring has yet been undertaken in this section.

According to the measurement of the sections in which coal occurs here, there is a thickness of some 2,963 feet, or about one foot of coal in every 110 feet of strata.

Of the sixteen seams mentioned, four are of the following dimensions: The Jukes', which averages 6'4"; Murray, 5'"; Howley, 4'2", and Cleary seam, 2'00". It will thus be seen we have here at least four seams of workable dimensions, or the same number as at Sydney, but the latter are somewhat thicker, aggregating 20'4" for the four seams, whereas ours aggregate 17'7", the difference being only 2'10" Of the remaining 12 seams in this Bay St. George section, five are over one foot thick, being one more than the Sydney section shows.

When we turn to the Grand Lake area we find in the various sections measured, an even better showing.

On Aldery Brook there are 15 coal seams exposed in a vertical thickness of about 1,200 feet or one seam to every 80 feet of strata. Six of these again show 2'0", 2'6", 3' and 6'6"; 1'8" and 1'6", aggregating 17'2", or 1 foot of coal in 70' strata.

At Coal Brook, nine seams occur in a thickness of 720 feet, or one in 80' of strata, six of which aggregate 10'7", or 1' foot of coal to 68' feet of strata. Two of these show 2'4" and 3'5" respectively.

On Kelvin Brook in a section of 946' we have nine seams aggregating about 14'0", or one seams to about 105' of strata, or 1 foot of coal to 67 feet of strata. Three of these are of the following dimensions: 2'6", 3'8" and 6'2".

In the section near Goose Brook, 20 seams were located in about 1,[illegible]00 feet of thickness, or one seam to 68 feet of strata. These twenty seams aggregate about 32 feet of coal, which gives an average of 1' of coal to every 40½ feet strata, being 10 feet less of rock to each foot of coal, than the Sydney section shows.

So you will see that the comparisons of actual coal contents do not differ so very much, and on the whole the resemblance is very striking.

In conclusion I shall just add a few closing remarks as to the cost of raising, shipping and marketing our coal, etc. Once the preliminary operations of erecting the necessary plant, making connections, and establishing a coal depot at some suitable locality for shipping were completed, I cannot see why this coal could not be mined and put on board ship just as cheaply as the product of the Cape Breton mines is to-day.

Let us take for example the Juke's seam in Bay St. George. This seam is so situated that it can be stripped of its cover, which is comparatively light, and for a long time it could be mined by quarrying or open cast, as it is termed. Much of it lies above the level of the Barachois River, and all the coal it contains down to that level, can be easily won. So far as I am aware there is no mineral product in the Island which could be more easily or cheaply mined, nor is there any that would give a greater yield for the same amount of labour. Two men could certainly with ordinary tools, mine 3 or 4 tons per day with the greatest ease. At the ordinary rate of miners' wages of $2.00 a day each, we have the cost of mining just $1.00 per ton, 20 cents more should be ample to remove it to the surface and dump it on board cars, at the mouth of the drifts or tunnels.

According as sufficient working space were made, more and more miners could be put on; fifty men could, without difficulty, mine 100 tons per day. Of course as soon as regular coal cutting machinery were substituted for manual labour, the output could be greatly increased.

Were a short connecting railway of about 8 miles constructed to tap the Reid system near Salt Springs, the coal would then be brought within 60 miles of Port aux Basques, where a depot might be established, which would be accessible all the year round. At the present railway rate of 7/10 of a cent per ton, per mile, the carriage thence would amount to 42 cents freight, or a total cost per ton at Port aux Basques, of $1.62. Allowing 38 cents more for handling and putting aboard ship, the coal should stand, when leaving the shipping point, not more than $2.00. The cost of freight from thence to our east coast markets, and the handling, storage or other expenses connected therewith, should be about the same as from Sydney, whatever they may amount to, certainly not more.

Assuming that the water borne freight was $2.00 per ton, and the handling, storage, etc., 50 cents, the coal should cost, landed here in St. John's somewhere in the vicinity of $4.50 per ton, at the outside. As there would be no duty levied on local coal, surely ours could compete favourably with any imported, even though the cost to the consumer were a dollar less than we are now paying, and that, too, for such a poor quality of fuel. Of course, in the above figures, I am only taking into account the cost of actual mining, transportation and shipping of the coal to our local markets, after a mine was fully established and all necessary connections and facilities for transportation, etc., were provided.

I fully recognize that a large sum of money would have to be expended to provide these facilities. I might say the whole question of utilizing our coal hinges on this latter point.

Having first established the fact that the coal is there in sufficient quantity, and of good quality, the question as to whether our present consumption, and the cost of mining and shipping would warrant going to the great expense entailed by the other requisities, is the one to be considered, and as to whether the profits on the coal would afford sufficient interest on the outlay or not. These are all questions for business men to determine. I do not profess to be sufficiently well posted on such matters myself. My humble opinion is, however, that when in full swing one year's profits would cover all the other expenses.

I append a few extracts from independent sources of qualified experts re our coal, to further bear out my statements, also analyses of the coals made some years ago by undoubted authorities of high repute.

Mr. Hugh Fletcher, Sr., Mining Engineer, visited and inspected the Cleary Coal areas in Bay St. George in 1874.

Speaking of the Jukes' seam Mr. Fletcher says: "The coal in this seam is bituminous, free from Sulphur, and of the very best quality."

"The smaller 2 foot (or Cleary Seam) showed coal of the same quality as the larger (Jukes') seam, but with a few traces of sulphur."

He also speaks of a small seam of "two or three inches of pure Canel," which I did not see.

Mr. A. D. Turnbull, M.E., who inspected the Cleary Coal areas in 1910 says of the Jukes' seam: "The seam has been exposed for a length of 102 feet and averages about 4 feet in thickness. The coal is excellent."

Again, "the Murray seam also a fine seam, etc." He adds, "there are several small outcrops on the Middle Barachoix River along the S. W. boundary of your claims. In fact there are indications of coal all over the property."

Of the Howley seam on Robinson's River, he says: "The average thickness of this seam is about 4 feet with a tendency to thicken. Some 80 feet of the seam have been exposed, and there is a fine solid block of coal in view."

In 1890 a Mr. Geddes, coal expert, Edinburgh, Scotland, examined several specimens of our coal I sent him at the instance of the late James Murray, M.H.A. and this is what Mr. G. remarks:

"From the general character of the coal, I do not think in the meantime an analysis of any of the specimens will be required, as there can be no doubt that the whole consits of coal of good quality, suited, I would say, for both household and for manufacturing purposes—the specimens showing seams very similar in character to what we have to deal with in Scotland. The characteristics of No. 1 are very much those of a seam of coal of the Midlothian coal field, which has not been worked for many years, but which was highly prized and commended the best price in the Edinburgh market.

"None of the specimens are of the character of the coals in the North of England, known as manufacturing coals, by which term there coking coals are meant; but so far as the manufacture of iron is concerned, there are specimens among those you send me which answer this purpose admirably I think."

	From Coal Brook.		From Kelvin Brook.
	No. 3.	No. 4.	No. 1.
Moisture	9.93	5.02	8.44
Volatile Matter......	24.01	31.25	28.54
Fixed Carbon	49.15	54.03	5 .07
Ash	16.14	8.66	11.53
Sulphur	.77	1.04	1.42
	100.000	100.000	100.000
Coke in closed vessel	66.06	63.73	63.92

FROM BAY ST. GEORGE.

	Clary Seam	Jukes Seam	Howley Seam	Shears Seam
Moisture..................................	3·548	3·036	2·784	4·90
Volatile matter..........................	30·897	30·344	29·784	33 12
Fixed Carbon	55·229	60·142	54 468	not given
Sulphur....................................	3 946	1 963	3·047	0·44
Ash..	6 386	4·515	10·430	3·16
	100·000	100·000	100·000	Coke 61·371*

* The evaporative power of this coal expressed in pounds of water evaporated by one lb of coal at 212 F. was 12.371, which considerably exceeds that of North Sydney, or the best Scotch, Walsh or English coals.

* FROM ALDERY BROOK, GRAND LAKE.

	No. 2.	No. 6.	No. 7.	No. 9.	No. 15.	No. 16.	No. 17.	No. 20.
Moisture	10·22	5·80	10·77	13·71	15·78	5·82	4·32	7·41
Volatile Matter	24·39	31·44	16·55	26·83	30·30	33·62	16·84	30·73
Fixed Carbon	48·51	57·86	33·89	51·06	45.29	55·28	72·66	52·49
Ash	15·72	4·08	37·86	7·56	8·08	4·49	5·53	7·71
Sulphur	1·16	·82	·93	·84	·55	·79	·85	·66
	100·000	100·000	100.000	100·000	100.000	100·000	100·000	100·000
Coke in closed vessel	65·39	62·76	72·68	59·56	33·92	60.56	78·84	61·85

* These latter assays were made for the Government, by Wm. H. **Fitton, F.G.S.**, F.S.Sc., **M.E**, England, in 1892.